Seawater Desalination

A Presentation to the
CALFED Water Use Efficiency Committee
Sacramento, California

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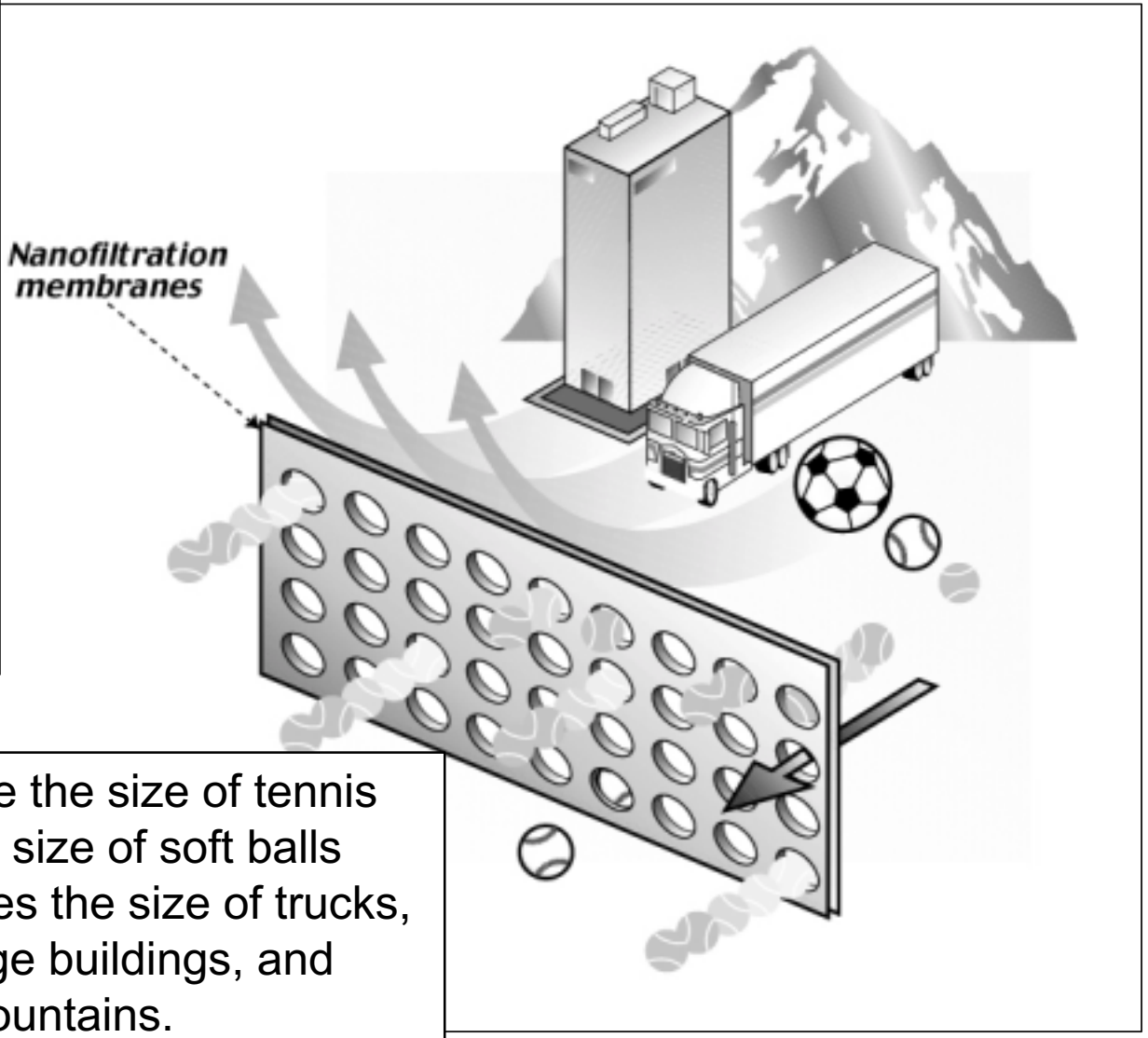
Federal Partnership

- Authorization
  - **Reclamation Recycling and Water Conservation Act of 1996 (H.R. 3660, Sec. 5, Desalination R&D Project)**
  - **Up to 50% of project total cost; $20 million max**
- Appropriations
  - **$1 Million in FY02 - Energy & Water Appropriations Bill**
  - **$1 Million in FY03 - House and Senate Appropriations Bills**
- Research Partnership with U.S. Bureau of Reclamation and the LADWP

Membrane Technology

Nanofiltration membranes are a semi-permeable material that allow almost nothing larger than water (H_2O) to pass through. Most salts, salt molecules being larger than H_2O, are left behind as are other "impurities."



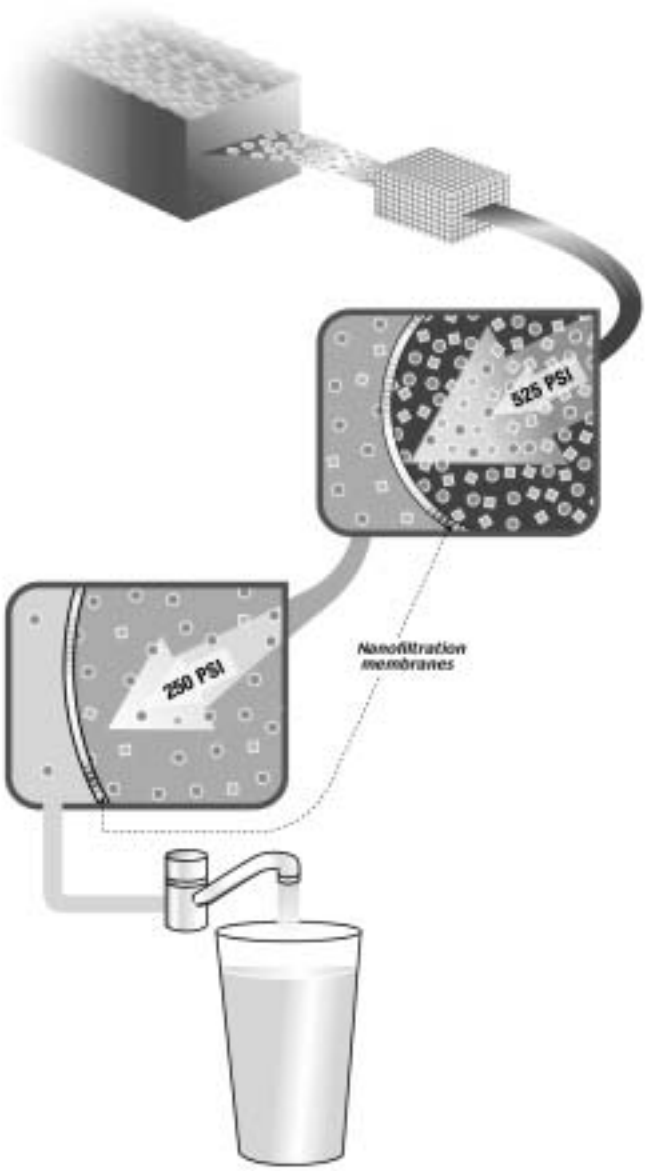
If water molecules were the size of tennis balls, salt would be the size of soft balls and soccer balls, viruses the size of trucks, bacteria the size of large buildings, and protozoa the size of mountains.

Long Beach Two-stage Nanofiltration

Press Release:

MAY 2, 2002

Long Beach Water Department Files U.S. Patent on Technology that has the Potential to Significantly Reduce the Cost of Seawater Desalination



Long Beach Two-stage Nanofiltration Method

- Energy Savings
  - **Lower pressure requirements ==> Lower energy consumption**
- Quality Protection
  - **Twice the protection of single-pass technology**

Community Based Seawater Desalination

- Small to medium sized communities when regional seawater desalination plants not feasible
- Local control
- Potentially fewer environmental issues with source water and seawater concentrate
- Lower pretreatment cost
- Lower cost of delivery into retail distribution system

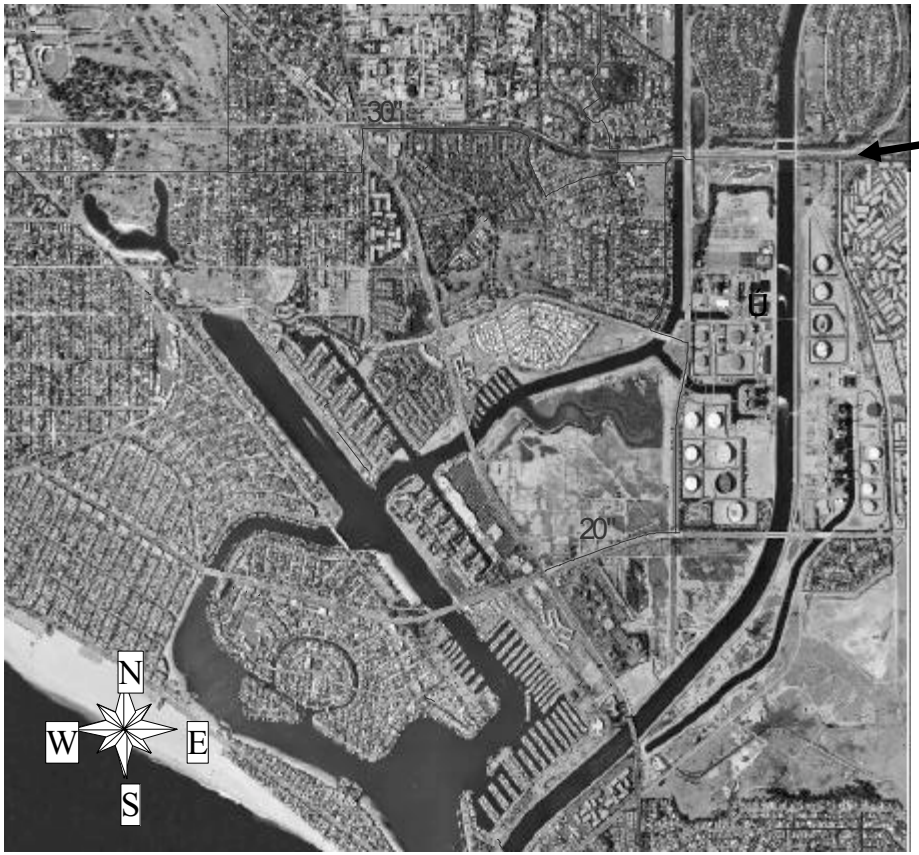
Pilot Phase:

Operational Since Fall 2001

9,000 gallon/day Pilot Plant

Research Phase:

Beginning Phase Spring 2002
250,000 gallon/day Prototype Plant



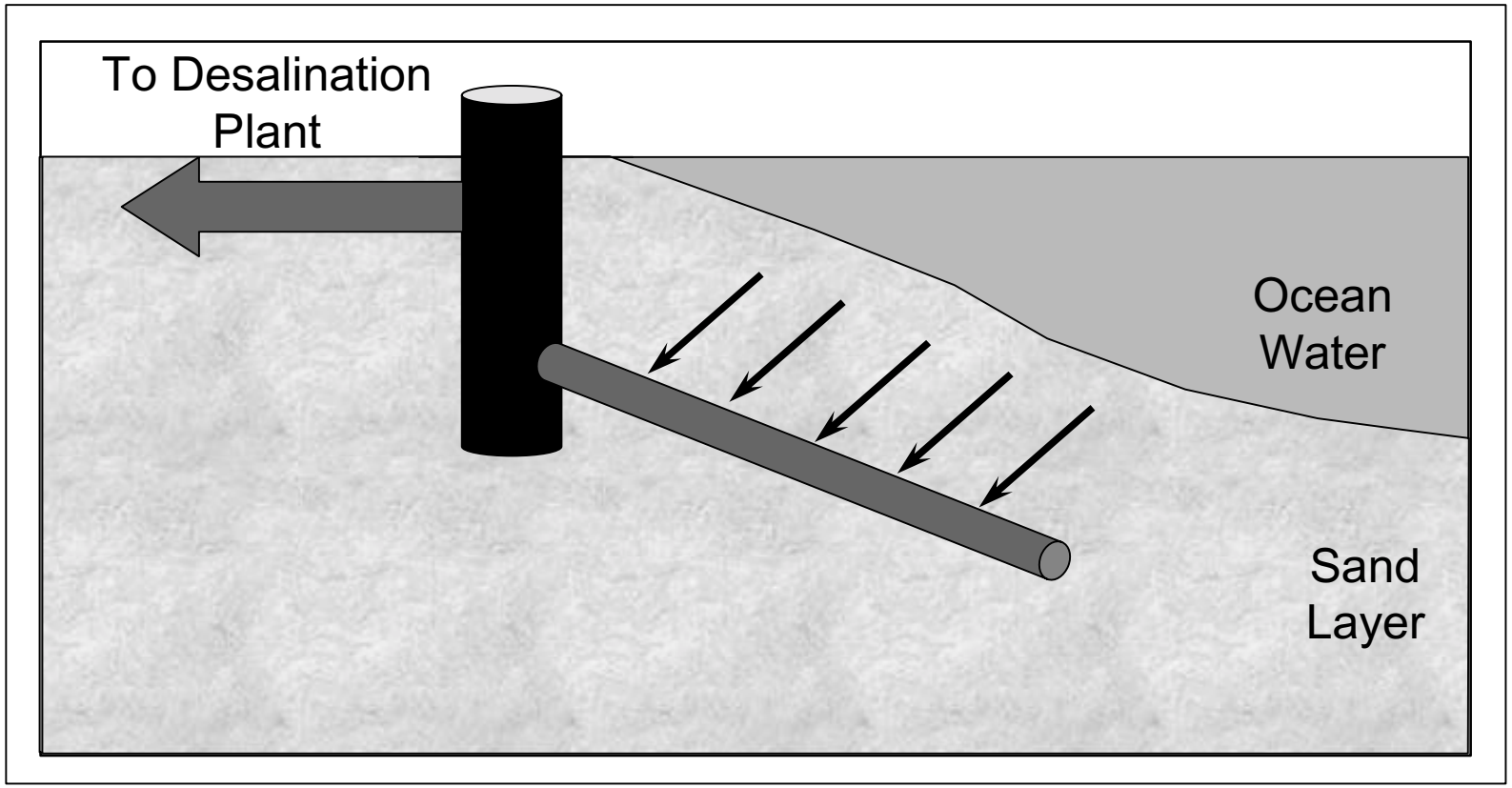
- At LADWP's Haynes Generation Station
- Research Partnership with U.S. BeRec and LADWP
- 3-years and $4 million

Research Phase:

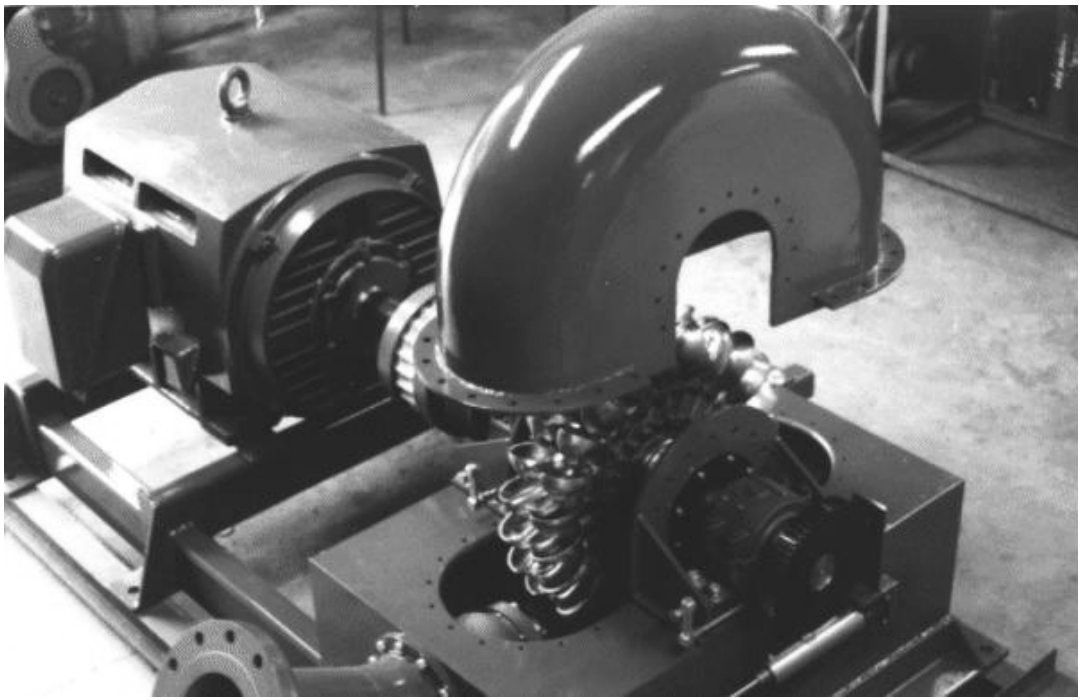
Focus of Research

- Source water
- Pretreatment (sand filtration vs. microfiltration)
- LB Two-stage Nanofiltration Method
- Energy recovery
- Long-term energy supply arrangement
- Integrate permeate into retail distribution system
- Seawater concentrate mitigation

Research Phase:
Pretreatment Options - Seawater Wells

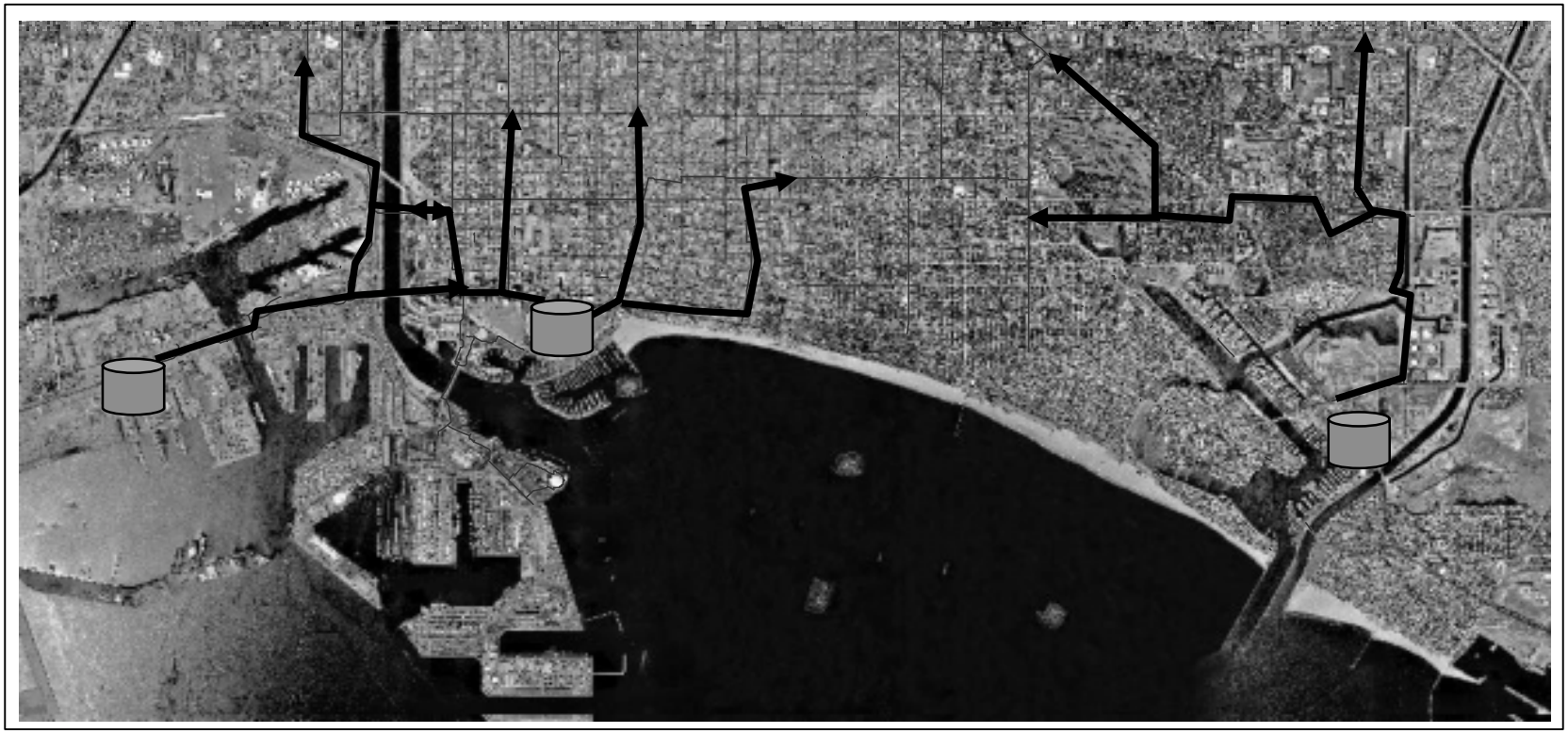


Research Phase:
Energy Recovery Options

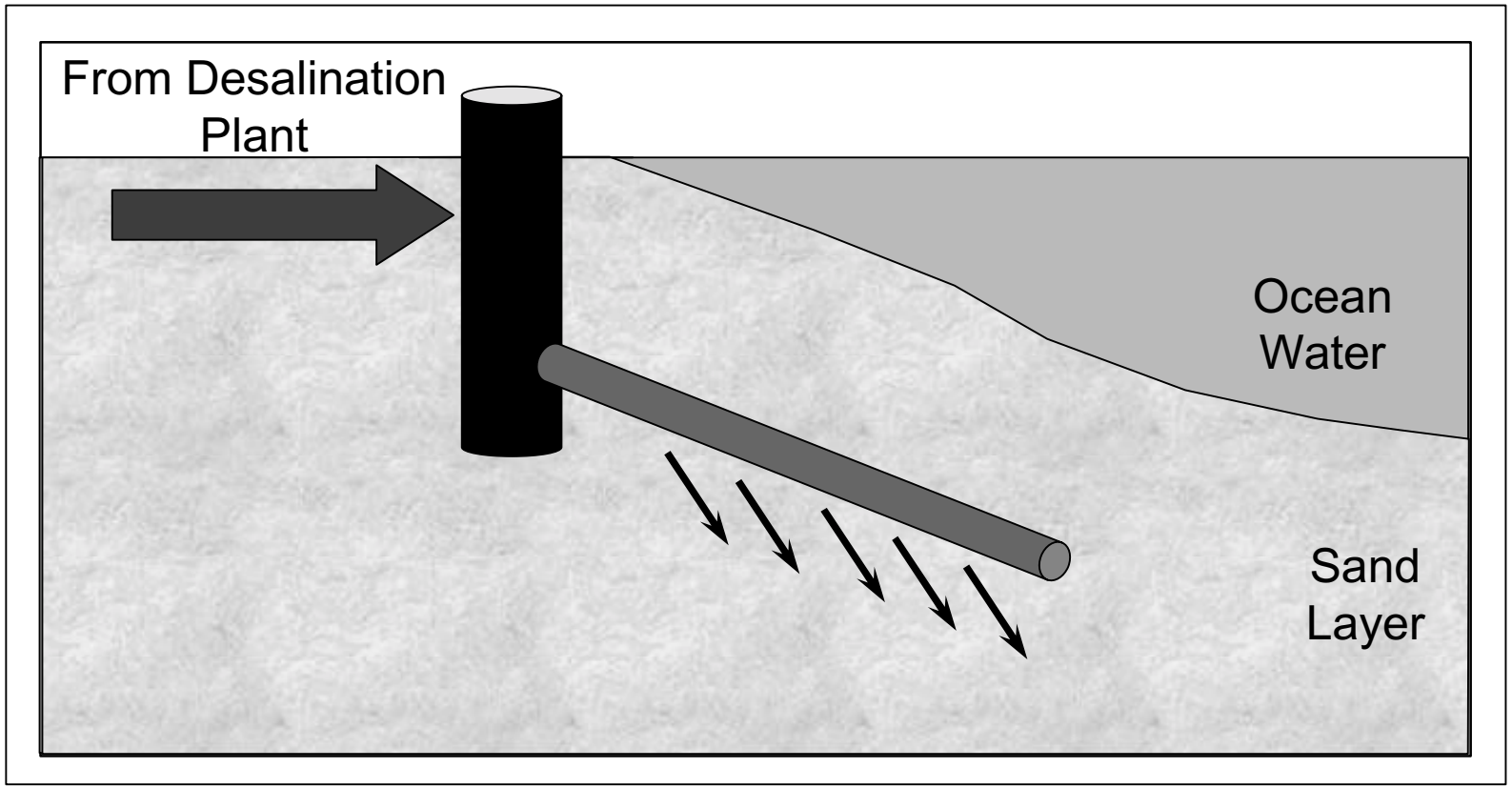


Research Phase:

Options to Integrate Permeate into Retail Distribution System



Research Phase:
Concentrate Return Options



Production Phase:
Full-scale Seawater Desalination

Conceptual Model

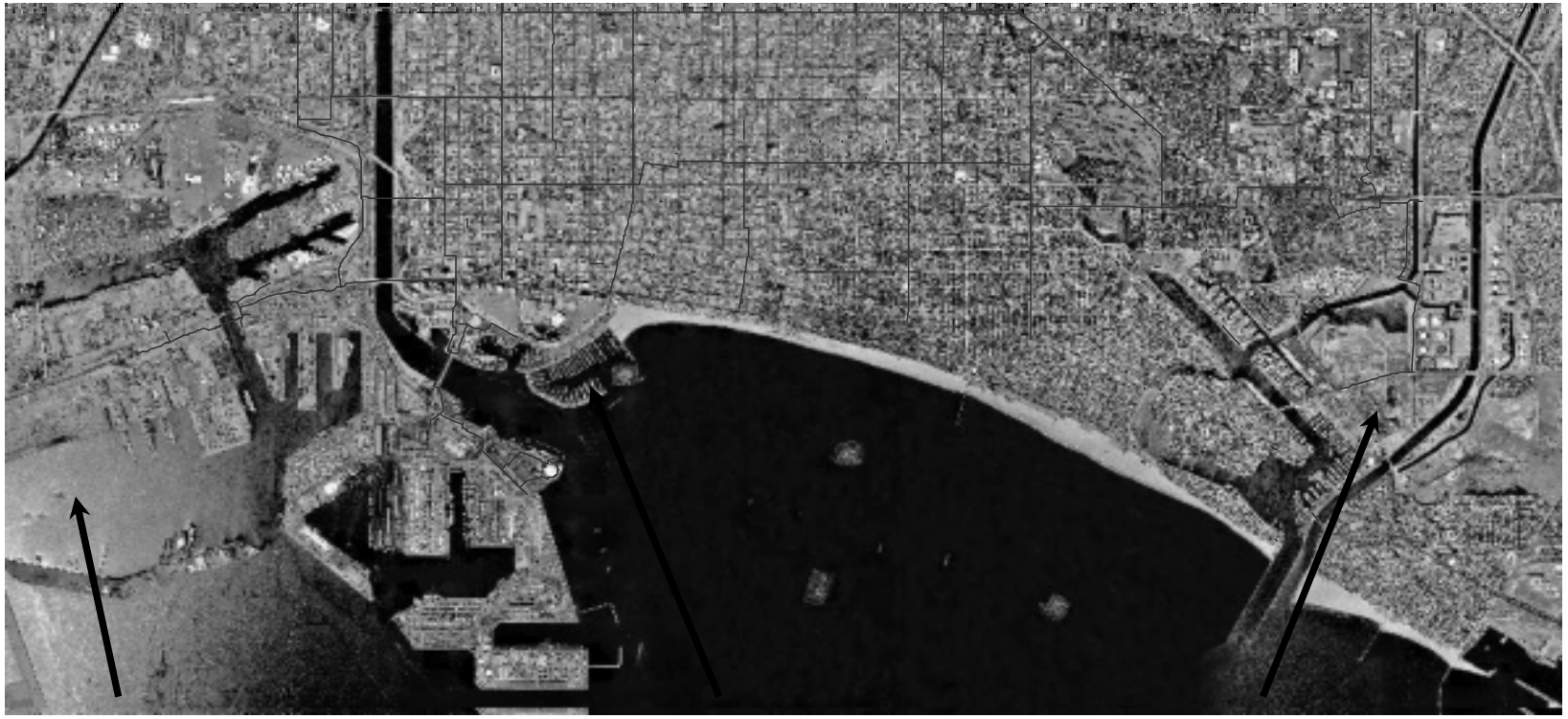
- 9 mgd (10,000 AFY)
- Sand filtration as Pretreatment
- Two-stage Nanofiltration
- Product water directly into retail distribution system
- 2009 on-line date

Production Phase:

Potential Sites

LA River

San Gabriel River



Several Sites in Port of Long Beach

Near Long Beach Convention Center

Two Major Power Generation Stations

LONG BEACH WATER DEPARTMENT

A Class 1 Water Utility

www.lbwater.org